

WHAT WE CLAIM IS:

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1. A halftone phase shift photomask comprising on a transparent substrate and a halftone phase shift film containing at least tantalum, oxygen, carbon and nitrogen, which photomask has a multilayer structure comprising at least two or more different layers.

2. The halftone phase shift photomask according to claim 1, which includes at least one layer wherein the composition ratio of tantalum atoms and oxygen atoms is such that at least 100 oxygen atoms are contained per 100 tantalum atoms.

3. The halftone phase shift photomask according to claim 1, which includes at least one layer wherein the composition ratio of tantalum atoms and other atoms is such that 100 or less other atoms are contained per 100 tantalum atoms.

4. The halftone phase shift photomask according to claim 1, which includes at least one layer wherein the composition ratio of tantalum atoms and oxygen and nitrogen atoms is such that 50 to 250 oxygen atoms and 1 to 200 nitrogen atoms are contained per 100 tantalum atoms.

5. The halftone phase shift photomask according to claim 1, which has a structure wherein a film with the composition ratio of tantalum atoms and oxygen atoms being such that at least 100 oxygen atoms are contained per 100 tantalum atoms is laminated on a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms.

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6. The halftone phase shift photomask according to claim 1, which has a structure wherein a film with the composition ratio of tantalum atoms and oxygen and nitrogen atoms being such that 50 to 250 oxygen atoms and 1 to 200
5 nitrogen atoms are contained per 100 tantalum atoms is laminated on a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms.

7. The halftone phase shift photomask according to
10 claim 1, which has a structure wherein a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms is directly formed on the transparent substrate, with subsequent films laminated successively
15 thereon.

8. The halftone phase shift photomask according to any one of claims 1 to 7, which has a structure wherein an etching stopper layer is formed on the transparent substrate, with halftone phase shift films laminated successively
20 thereon.

9. The halftone phase shift photomask according to claim 8, which has a structure wherein halftone phase shift films are successively laminated on the etching stopper layer formed of a film composed mainly of hafnium oxide.

25 10. A halftone phase shift photomask blank comprising on a transparent substrate a halftone phase shift film containing at least tantalum, oxygen, carbon and nitrogen,

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which has a multilayer structure comprising two or more layers.

11. The halftone phase shift photomask blank according to claim 10, which includes at least one layer wherein the composition ratio of tantalum atoms and oxygen atoms is such
5 that at least 100 oxygen atoms are contained per 100 tantalum atoms.

12. The halftone phase shift photomask blank according to claim 10, which includes at least one layer wherein the composition ratio of tantalum atoms and other atoms is such
10 that 100 or less other atoms are contained per 100 tantalum atoms.

13. The halftone phase shift photomask blank according to claim 10, which includes at least one layer wherein the composition ratio of tantalum atoms and oxygen and nitrogen
15 atoms is such that 50 to 250 oxygen atoms and 1 to 200 nitrogen atoms are contained per 100 tantalum atoms.

14. The halftone phase shift photomask blank according to claim 10, which has a structure wherein a film with the composition ratio of tantalum atoms and oxygen atoms being
20 such that at least 100 oxygen atoms are contained per 100 tantalum atoms is laminated on a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms.

15. The halftone phase shift photomask blank according to claim 10, which has a structure wherein a film with the composition ratio of tantalum atoms and oxygen and nitrogen
25 atoms being such that 50 to 250 oxygen atoms and 1 to 200

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nitrogen atoms are contained per 100 tantalum atoms is laminated on a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms.

5 16. The halftone phase shift photomask blank according to claim 10, which has a structure wherein a film with the composition ratio of tantalum atoms and other atoms being such that 100 or less other atoms are contained per 100 tantalum atoms is directly formed on the transparent
10 substrate, with subsequent films laminated successively thereon.

 17. The halftone phase shift photomask blank according to any one of claims 10 to 16, which has a structure wherein an etching stopper layer is formed on the transparent
15 substrate, with halftone phase shift films laminated successively thereon.

 18. The halftone phase shift photomask blank according to claim 17, which has a structure wherein halftone phase shift films are successively laminated on the etching stopper
20 layer formed of a film composed mainly of hafnium oxide.

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